From 1920 to 1922 the retail price of spots varied from 15 to 30 cents a pound. During the fall, however, an entire trayful of fish of about 60 pounds could be bought at a price varying from $4 to $10. The fish caught in the spring and summer usually weigh one-third to one-fourth of a pound, but the fish caught in the fall weigh from one-half to 1 pound each. The largest fish seen during the present investigation were taken at Ocean View, Va., on October 27, 1926. One of these individuals measured 13⅗ inches in length and weighed 19 ounces, and another had a length of 13⅕ inches and a weight of 22 ounces. These fish apparently represent the maximum length attained by the species.

The spot is generally common in coastal waters of the Middle Atlantic States and southward. It ascends brackish and fresh-water streams, and occasionally is taken in strictly fresh water. "Spot" is the most generally used common name in Chesapeake Bay. In the vicinity of the mouth of the Potomac it is sometimes called "croaker," and at Baltimore the name "silver gudgeon" was heard.

Habitat.—Massachusetts to Texas.

Chesapeake localities.—(*a*) Previous records: Various localities. (*b*) Specimens in collection: From every locality visited, from Havre de Grace, Md., to the entrance of the bay.

Following is a table of comparisons of length and weights of spots taken in the lower parts of Chesapeake Bay during April and May and during September and October. In a measure the table brings out the fact, well known to fishermen and dealers, that fish are not as "fat" in the spring of the year as they are in the fall.

Length, in inches	Spring		Fall		Length, in inches	Spring		Fall	
	Weight	Number of fish weighed and measured	Weight	Number of fish weighed and measured		Weight	Number of fish weighed and measured	Weight	Number of fish weighed and measured
	Ounces		*Ounces*			*Ounces*		*Ounces*	
4–4⅛			0.5	2	8–8⅛	4.0	16	4.0	37
4⅛–4⅞			.75	50	8⅛–8⅞	5.0	2	5.0	18
5–5⅛			1.00	117	9–9⅛	5.3	1	6.4	19
5⅛–5⅞	1.1	6	1.3	142	9⅛–9⅞	6.6	1	7.9	23
6–6⅛	1.5	24	1.75	107	10–10⅛			9.0	26
6⅛–6⅞	1.9	35	2.3	66	10⅛–10⅞			10.0	10
7–7⅛	2.7	32	2.9	70	12⅛–12⅞			18.0	1
7⅛–7⅞	3.2	14	3.4	48	13–13⅛	19.0	1	22.0	1

120. Genus SCIÆNOPS Gill. Red drums

Body elongate, compressed; back moderately arched; teeth in the jaws well developed; preopercle serrate in young, becoming entire with age; slits and pores about the mouth well developed; no barbels; no scales on soft dorsal; caudal fin pointed in very young, becoming square to slightly concave with age. A single species, reaching a large size, is known.

153. Sciænops ocellatus (Linnæus). "Drum"; "Red drum"; Redfish; Channel bass.

Perca ocellata Linnæus, Syst. Nat., ed. XII, 1766, p. 483; South Carolina.

Sciænops ocellatus Uhler and Lugger, 1876, ed. I, p. 119; ed. II, p. 100; Bean, 1891, p. 89; Jordan and Evermann, 1896–1900, p. 1453, Pl. CCXXII, fig. 567; Evermann and Hildebrand, 1910, p. 162; Welsh and Breder, 1923, p. 184.

Head 2.85 to 3.3; depth 3.35 to 3.95; D. X–I, 23 to 25; A. II, 8; scales 40 to 45. Body elongate; back somewhat elevated; ventral outline nearly straight; head rather long and low; snout conical, 3.3 to 3.8; eye 3.15 to 4.75; interorbital 3.7 to 4.6; mouth horizontal; lower jaw included, with large pores but no barbels; maxillary reaching nearly opposite posterior margin of eye, 2.1 to 2.45 in head; teeth in the jaws in villiform bands, the outer ones in the upper jaw enlarged; preopercular margin coarsely serrate; gill rakers short, 8 or 9 on lower limb of first arch; scales rather large, firm, strongly ctenoid, reduced in size on head; dorsal fins contiguous, the first composed of rather stiff, pungent spines, not much higher than the second; caudal fin pointed in very young, becoming straight to slightly concave in larger fish; second anal spine thick, much shorter than the longest soft rays;

ventral fins moderate, inserted a little behind base of pectorals; pectoral fins rather small, 1.55 to 1.85 in head.

Color of a 42½-inch specimen silvery, tinged with greenish bronze above; white below; scales on sides with dark centers, forming stripes; one irregular jet black spot at base of caudal above lateral line; dorsal and caudal fins dusky; anal and ventrals white; pectorals bright rusty on outer

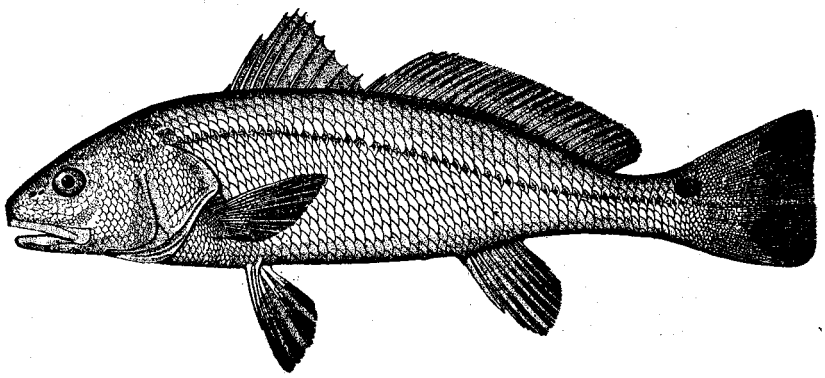

FIG. 157.—*Sciænops ocellatus*. From a specimen 12 inches long

part. Some fish turn red after death. The number of spots at base of caudal varies from one to several. One specimen, 15 inches long, for example, had four spots on one side and eight on the other, and they extended from the base of the caudal along the sides. Most frequently, however, only a single spot is present on each side at the base of the caudal. Young of about 100 millimeters (4 inches) and less in length have large black spots or blotches distributed over the entire side and back. These spots are present, being more diffuse, however, in our smallest specimens (20 millimeters in length). The young, up to 40 millimeters in length, have a dark vertical bar on base of caudal.

The collection contains four specimens, ranging in length from 165 to 225 millimeters (6½ to 9 inches), and many small ones ranging from 20 to 90 millimeters (⅘ to 3½ inches) in length. Many large examples, too large to preserve conveniently, were observed.

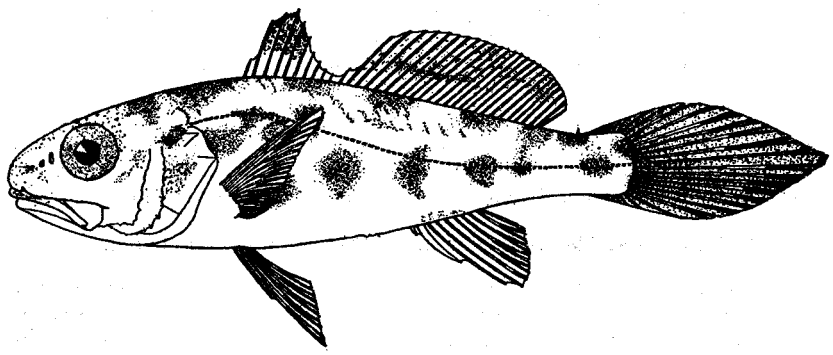

FIG. 158.—Young, 42 millimeters long

The young differ from the adults chiefly in color and in the shape of the caudal fin. These differences have been pointed out in the description. This drum is characterized by the elongate body, the absence of barbels about the mouth, and the presence of one or more black spots at base of caudal.

The food of this fish, according to the contents of 15 stomachs taken from fish ranging in length from 30 to 1,075 millimeters (1¼ to 42½ inches), consists of crustaceans, the smaller fish having fed principally on Gammarus and Mysis and the larger ones on shrimp.

Little is known about the spawning and life history of this fish. Welsh and Breder (1923, p. 184) offer the following: "Spawning occurs chiefly in the late fall or early winter, although from the size of some young fish taken in Florida waters in January it is probable that some spawning may take place as early as September. The eggs and larval stages have not been studied."

The smallest specimens (20 millimeters and upward) in the present collection appear to be the youngest of record. In view of the fact that records of young red drum are scarce, the following catches made in Chesapeake Bay are given:

Date	Locality	Number of specimens	Length	
1921			*Millimeters*	*Inches*
Sept. 19	Crisfield, Md.	6	24-34	1.0-1.3
Sept. 20	Cape Charles, Va.	7	20-42	.8-1.6
Oct. 7	Buckroe Beach, Va.	6	44-53	1.7-2.1
Oct. 11	York River (lower)	23	26-46	1 -1.8
Oct. 15	Rappahannock River (lower)	1	49	2
Oct. 26	Patuxent River (lower)	45	25-45	1 -1.8
Nov. 21	Crisfield, Md.	2	48-54	1.9-2.1
Nov. 23	Cape Charles, Va.	28	39-90	1.5-3.5
July 1	York River (lower)	4	165-225	6.5-8.8

The red drum has but small commercial importance in Chesapeake Bay. During 1920 the catch for the entire bay was 17,565 pounds, worth $280. Maryland is credited with 28 per cent of this amount, or 4,835 pounds, and Virginia with 72 per cent, or 12,730 pounds. Virtually the entire catch was taken with pound nets.

This fish is taken from May until October and is most abundant during the spring and fall. It is most common about the entrance of the bay, and is seldom taken above Chesapeake Beach, Md.

The size of market fish varies from ½ to about 40 pounds. Fish of more than 50 pounds are rare. During 1922, the smaller fish (10 pounds or less) sold at retail for 10 to 15 cents a pound, whereas the larger fish were cut into steaks, which sold for 5 to 10 cents per pound. The smaller fish are superior to the larger ones, which are coarse of flesh and lacking in flavor. In the lower Chesapeake markets the demand for this species is small. The names most used for the species in the Chesapeake region are "drum" and "red drum." Along the New Jersey coast, where this drum is a favorite with surf anglers, it is known as the "channel bass." Along the South Atlantic and Gulf coasts, it is an important food fish and is called "redfish."

Habitat.—Massachusetts to Texas; not taken in commercial numbers north of the coast of New Jersey.

Chesapeake localities.—(*a*) Previous records: Gloucester Point, Cape Charles city, "southern parts of the bay." (*b*) Specimens in collection (young): Solomons and Crisfield, Md., lower Rappahannock River, lower York River, Cape Charles, and Buckroe Beach, Va. Larger fish were observed at many points, from Solomons, Md., southward to the entrance of the bay.

121. Genus LARIMUS Cuvier and Valenciennes. Banded drums

Body rather short, compressed; skull firm, not greatly cavernous; upper jaw with slits and pores little developed; no barbels; teeth all small, no canines; snout very short; mouth large, very oblique to vertical; preopercle with a membranous edge, without bony serræ; pseudobranchiæ well developed; gill rakers long and slender; second dorsal fin long; anal fin short.

154. Larimus fasciatus Holbrook. Banded drum; "Bastard perch."

Larimus fasciatus Holbrook, Ichthyol., South Carolina, 1860, p. 153, Pl. XXII, fig. 1; Charleston, S. C. Bean, 1891, p. 88; Jordan and Evermann, 1896-1900, p. 1424.

Head 2.9 to 3.7; depth 2.4 to 2.85; D. X–I, 24 to 27; A. II, 6 to 8; scales 50 to 56. Body rather deep, compressed; head short, deep; snout very short, blunt, 3.75 to 4.5 in head; eye 3 to 3.8; interorbital 2.8 to 3.06; mouth very oblique; lower jaw protruding; maxillary reaching about to vertical from center of eye, 1.85 to 2.5 in head; teeth all small, pointed, in a single series in each jaw; gill

rakers long and slender, 23 to 25 on lower limb of first arch; scales moderate, ctenoid, extending forward on head, cheeks, and opercles; small scales present at least on the base of the fins; dorsal fins contiguous, the first with slender, flexible spines, the third and fourth the longest, rather longer than the longest soft rays; caudal fin slightly rounded in adult, lanceolate in young; anal fin small, the second spine large and strong, 2.5 to 2.65 in head; ventral fins rather large, inserted slightly behind base of pectorals; pectoral fins 1 to 1.35 in head.

Color in alcohol grayish above, silvery underneath; sides with seven to nine vertical black bars; fins plain with dusky punctulations; mostly yellowish in life.

This species is represented in the present collection by three specimens, respectively 190 millimeters (7½ inches), 200 millimeters (7⅞ inches), and 215 millimeters (8½ inches) long. The foregoing description is based upon these and 12 specimens from Beaufort, N. C., ranging in length from 30 to 205 millimeters (1¼ to 8⅛ inches). This fish is the only one of this genus of tropical fishes that ranges northward as far as Chesapeake Bay. It is readily recognized by its short body, nearly vertical mouth, and dark bands on the sides.

This species is not a stranger to the fishermen of the lower sections of Chesapeake Bay, where it is known as the "bastard perch," some of the fishermen believing it to be a cross between the "sand perch" (*Bairdiella chrysura*) and the black drum (*Pogonias cromis*). However, it is not common enough to rank as a food fish of any importance in Chesapeake Bay. Welsh and Breder (1923, p. 170) offer the following relative to its distribution: "South of this point (Cape Hatteras) and on the shores of the Gulf of Mexico it is one of the most abundant fishes, being taken in large numbers in the trawls of the shrimp fishermen." These authors, however, say that the majority of the fish caught in shrimp trawls are small, individuals exceeding 8 inches in length being rare; and that, furthermore, the species is of little or no economic importance because of its small size.

Habitat.—Massachusetts to Texas, occurring only as a straggler north of Chesapeake Bay.

Chesapeake localities.—(*a*) Previous record: Cape Charles city, Va. (*b*) Specimens in collection: From Lynnhaven Roads, Va. The species was observed only in the southern part of the bay.

122. Genus BAIRDIELLA Gill. Mademoiselle

Body moderately elongate; compressed; back elevated; mouth oblique; gill rakers rather long; preopercle with serrate margin, the lower spine curved downward and forward; skull little cavernous; coloration plain. A single species of this genus of tropical fishes occurs in Chesapeake Bay.

155. Bairdiella chrysura (Lacépède). "White perch"; "Sand perch"; "White sand perch"; "Virginia perch"; "Yellow-tail"; "Tint."

Dipteroden chrysurus Lacépède, Hist. Nat. Pois., III, 1803, p. 64; South Carolina.

Liostomus xanthurus Uhler and Lugger, 1876, ed. I, p. 117; ed. II, p. 99. (Not *L. xanthurus* Lacépède.)

Bairdiella chrysura Bean, 1891, p. 88; Jordan and Evermann, 1896-1900, p. 1433, Pl. COXXII, fig. 566; Evermann and Hildebrand, 1910, p. 163; Fowler, 1918, p. 18; Welsh and Breder, 1923, p. 171.

Head 2.85 to 3.4; depth 2.8 to 3.15; D. XI or XII, 19 to 21; A. II, 9 or 10; scales 55 to 59. Body oblong, compressed; back moderately elevated; head moderate; snout conical, 3.75 to 4 in head; eye 2.85 to 4.15; interorbital 3.75 to 4.15; mouth a little oblique, terminal; maxillary reaching nearly or quite below posterior margin of pupil, 1.95 to 2.35 in head; teeth small, those in upper jaw in a band, mostly in a single series in lower jaw; preopercle serrate, a few of the spines at angle somewhat enlarged; gill rakers rather long, slender, 14 to 16 on lower limb of first arch; scales moderate, rather firm, ctenoid, small scales covering most of soft dorsal, caudal, and anal fins, also present on base of ventrals and pectorals; dorsal fins contiguous, the first composed of slender spines, the third and fourth spines the longest, higher than any of the rays in the soft part of the fin; caudal fin very slightly double, truncate in adult, the middle rays longest, broadly rounded in young; anal fin with one very short and one rather long strong spine, not quite reaching the tips of the soft rays immediately behind it, origin of fin somewhat behind middle of base of soft dorsal; ventral fins inserted a little behind base of pectoral, equal to or a little longer than pectorals; pectoral fins short, not reaching tips of ventrals, 1.4 to 1.55 in head.

Color olivaceous, greenish, or bluish gray above; lower part of sides and abdomen bright silvery; fins mostly yellowish; dorsals and caudal and sometimes the anal partly dusky.

Many specimens of this species, ranging in length from 22 to 225 millimeters (⅞ to 8⅞ inches), were preserved. The young do not differ greatly from the adults. Very young of 22 millimeters in length are rather deeper and more strongly compressed anteriorly than the adults. Fish of this size are largely pale in color, with dusky punctulations and a dark spot on the opercle at the upper

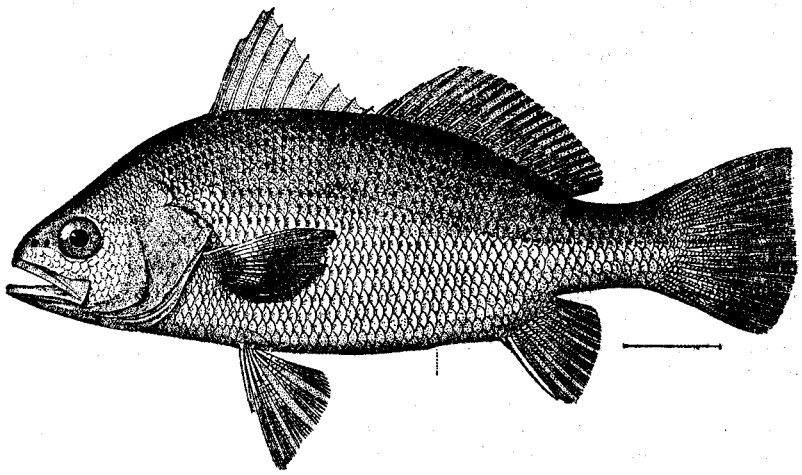

FIG. 159.—*Bairdiella chrysura*

posterior angle. Fish 40 millimeters and upward in length are colored essentially like the adult and are very similar in form and general appearance. This fish is readily recognized by its plain coloration, yellowish caudal fin, rather deep, compressed body, its oblique terminal mouth, and serrated preopercle.

The food of this fish in Chesapeake Bay, as shown by the stomach contents of 100 specimens examined, consists very largely of small and minute crustaceans. Foods of much less importance are annelids and fish, Only two individuals of the entire lot examined had fed on fish.

Spawning takes place in late spring and early summer. Ripe fish of both sexes were trawled in 12 fathoms off Crisfield as early as May 16. Many fish had already spawned by June 11. The eggs are small and are produced in large numbers. A single apparently nearly ripe female, 140 millimeters long, taken in Lynnhaven Roads on May 9, 1921, contained approximately 52,800 eggs. The embryology and larval development of this species has been described by Kuntz (1914, pp. 4–13) from material secured at Beaufort, N. C. The eggs are described as being spherical in form and 0.7 to 0.8 milli-

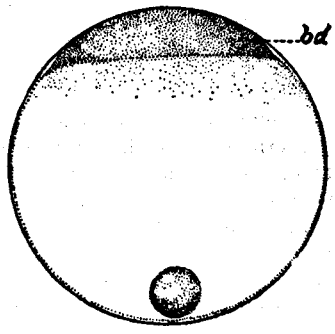

FIG. 160.—Egg recently fertilized, with fully developed blastodisc

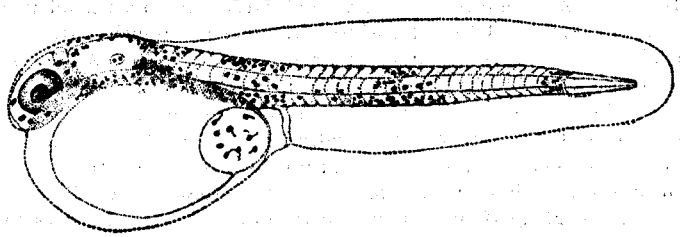

FIG. 161.—Newly hatched larva, 1.8 millimeters long

meter in diameter, pelagic, and hatched at laboratory temperature in about 18 hours. At the time of hatching the larvæ are 1.5 to 1.8 millimeters in length. By the time the young fish reaches a length of 30 millimeters the fins are fully differentiated, the body is covered with small, deeply embedded scales, and they show many of the diagnostic characters of the adult.

Welsh and Breder (1923, p. 174) contribute the following relative to the rate of growth:

> By the first winter a length of from 6 to 14 centimeters (2½ to 5½ inches) is attained, depending on the time of hatching, the average length for May-hatched fish being about 12 centimeters (4¾ inches) and for June-hatched fish about 10 centimeters (4 inches). During the winter months growth practically stops. The average increment of growth the second season is about 6 centimeters (2⅜ inches), with a length for the second winter of from 12 to 20 centimeters (4¾ to 8 inches). The first spawning occurs in the third season, when the fish are 2 years old and between 15 and 21 centimeters in length (6 to 8¼ inches). After the first spawning the growth is slow, the largest fish of which scales were examined having reached a length of 23 centimeters (9 inches) at the age of 6 years.

The foregoing data by Welsh and Breder were derived from the measurement of specimens taken at Beaufort, N. C., and in Chesapeake Bay, supplemented by the study of scales.

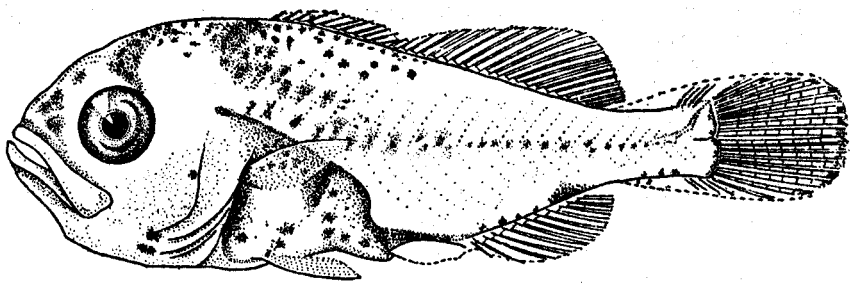

FIG. 162.—Young, 11 millimeters long

Data relative to the rate of growth derived from a large series of measurements made of young fish caught in Chesapeake Bay during 1921 and 1922 do not differ notably from those given by Welsh and Breder. The following variations (that is, extremes in length) were secured from certain collections apparently consisting of individuals in their first summer: July 8 to 12, 23 to 58 millimeters (⅞ to 2⅓ inches), about 500 fish; July 23 to 31, 20 to 85 millimeters (⅘ to 3⅓ inches), about 1,000 fish; August 4 to 8, 25 to 90 millimeters (1 to 3½ inches), about 400 fish; September

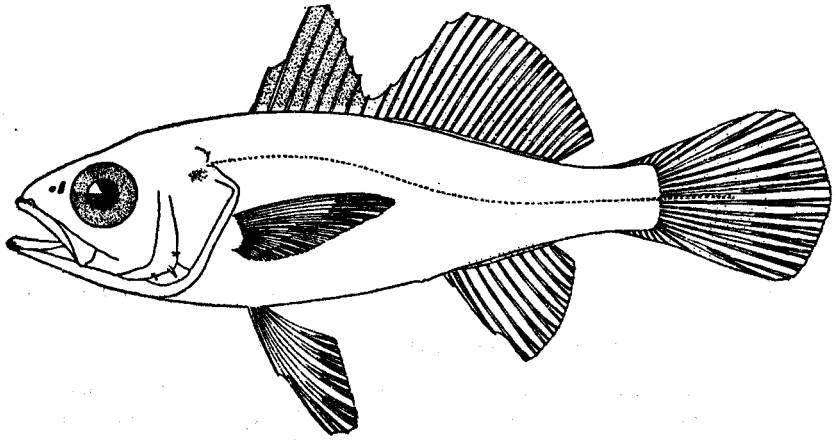

FIG. 163.—Young, 33 millimeters long

14 to 16, 40 to 109 millimeters (1⅗ to 4⅓ inches), 40 fish; October 5 to 19, 55 to 98 millimeters (2⅙ to 3⅞ inches), 70 fish; November 22 and 23, 76 to 117 millimeters (3 to 4½ inches), 40 fish. It was found from measurements of larger fish (that is, fish ranging from about 4½ to 9 inches), taken during September and October, that these fell into two groups, a decided break occurring in a frequency curve between the two. The predominating sizes of the individuals composing the group of smaller fishes ranged from 130 to 145 millimeters (5⅛ to 5¾ inches). These fish were believed to be in their second summer. The predominating sizes of the next group ranged from 165 to 195 millimeters (6½ to 7⅔ inches), and these probably were in their third summer.

Some of the young fish of this species stay in the bay throughout the winter and were not infrequently taken in deep water.

The sand perch is a very abundant fish in Chesapeake Bay, but because of its small size a comparatively small part of the catch is marketed, the remainder, in large part, being wasted. Thousands of discarded sand perch frequently are seen floating on the surface of the water or strewn on the beaches about the fishing camps. It is a food fish of good flavor, and a large percentage of the catch could be utilized if a demand for the fish were created. A large part of the commercial catch consists of fish 7½ to 8½ inches in length, weighing about one-fourth pound each.

The sand perch is caught chiefly with pound nets, haul seines, and hook and line. The season extends from April until November, October being the month when the fish are most abundant. It is most common in the lower part of the bay, decreasing in abundance northward, and north of Baltimore it is rarely taken.

Various names have been given to this fish in Chesapeake Bay. "Sand perch," "white sand perch," and "white perch" are the most commonly used. Confusion is caused by calling this species "white perch," as this name is well established for *Morone americana*. Names less commonly used are "Virginia perch," "yellow-tail," and "tint."

The largest fish observed in Chesapeake Bay was 9¼ inches in length, which is about the maximum size attained by this species, and it weighed 6 ounces. Fish of slightly less than 9 inches are common and of sufficient size to be utilized as food. Small quantities are sold in the Norfolk and Baltimore markets, and some are peddled inland among the country people. The retail price during 1922 was 10 to 15 cents per pound.

Habitat.—New York to Texas.

Chesapeake localities.—(*a*) Previous records: Various sections of Chesapeake Bay, from the mouth of the Potomac River southward. (*b*) Specimens in collection: From many localities, from Annapolis, Md., to Cape Charles and Cape Henry, Va. Apparently rare north of Annapolis.

Comparison of lengths and weights of sand perch

Number of fish weighed and measured	Length	Weight	Number of fish weighed and measured	Length	Weight
	Inches	*Ounces*		*Inches*	*Ounces*
1	3	0.3	5	6¼	1.6
3	3½	.4	18	6½	2.2
4	3¾	.4	20	6¾	2.3
7	4	.5	26	7	2.6
8	4¼	.6	34	7¼	3.0
11	4½	.7	29	7½	3.3
12	4¾	.8	33	7¾	3.6
18	5	1.0	37	8	4.0
40	5¼	1.1	28	8¼	4.2
51	5½	1.2	15	8¾	4.5
18	5¾	1.3	5	9	5.0
15	6	1.5	6	9¼	5.3

NOTE.—Most of these fish were from total catches made with collecting seines and are therefore unselected. The scarcity of fish 6 to 6⅜ inches long, already mentioned, is illustrated in a measure by this table. It is probable that most of the fish of less than 6½ inches are immature.

123. Genus STELLIFER (Cuvier) Oken

This genus is distinguished from related genera by the very cavernous construction of the bones of the skull, the septa being reduced to the thinness of the walls of honeycomb. The skull is rather broad, somewhat depressed between the eyes, and more or less spongy to the touch.

156. Stellifer lanceolatus (Holbrook).

Homoprion lanceolatus Holbrook, Ichth, South Carolina, ed. I, 1855, p. 168, Pl. XXIII; Beaufort, S. C.
Stellifer lanceolatus Jordan and Evermann, 1896–1900, p. 1443.

Head 3.45; depth 2.75; D. XII–I, 21; A. II, 8; scales 49. Body oblong, compressed; head rather low; snout blunt, 3.5 in head; eye 4.05; interorbital broad, 2.4; mouth moderate, oblique; lower jaw included; maxillary reaching about opposite posterior margin of pupil, 2.25 in head; teeth in the jaws in bands, the one on lower jaw very narrow; preopercular margin with enlarged spines; gill rakers slender, 21 on lower limb of first arch; scales firm, ctenoid, extending more or

less on all of the fins; dorsal fins contiguous, the first with slender, flexible spines; the longest spines not much higher than the longest rays of the second dorsal; caudal fin lanceolate; second anal spine enlarged, not quite as long as the soft rays following it; ventral fins rather small, inserted under base of pectorals; pectoral fins rather long, 1.05 in head.

Color in alcohol uniform silvery, darker above than below; fins mostly plain translucent, the spinous dorsal with black margin.

A single specimen, 165 millimeters (6½ inches) in length, was secured, and it forms the basis for the foregoing description.

This small drum apparently has not been recorded from any locality north of Beaufort, N. C. It probably seldom exceeds the length of the fish in hand, and although abundant on the South Atlantic and Gulf coasts it has no commercial value. The young are said to resemble young croakers and spots, from which however, they may be distinguished by the larger head and strongly oblique mouth. Welsh and Breder (1923, p. 175) state that spawning occurs in late spring or early summer, May and June being the principal months during which spawning takes place on the Atlantic coast. The eggs and larvæ have not been studied, and the species as yet has no common name.

Habitat.—Chesapeake Bay to Texas; not common north of South Carolina.

Chesapeake localities.—(*a*) Previous records: None. (*b*) Specimen in collection: Taken in a pound net in Lynnhaven Roads, Va., July, 1921.

124. Genus MICROPOGON Cuvier and Valenciennes. Croakers

Body elongate, compressed; back somewhat elevated; preopercle strongly serrate; teeth in the jaws in villiform bands; chin with a row of short, slender barbels on each side; gill rakers short; spinous dorsal consisting of 10 to 11 spines; anal with two spines, the second strong and of moderate length. A single species of this genus is known from Chesapeake Bay.

157. Micropogon undulatus (Linnæus). Croaker; Crocus; "Hardhead"; "King Billy."

Perca undulatus Linnæus, Syst. Nat., ed. XII, 1766, p. 483; South Carolina.

Micropogon undulatus Uhler and Lugger, 1876, ed. I, p. 119; ed. II, p. 102; Bean, 1891, p. 89; Smith, 1892, p. 72; Jordan and Evermann, 1896–1900, p. 1461, Pl. CCXXIV, fig. 570; Evermann and Hildebrand, 1910, p. 162; Fowler, 1912, p. 56, and 1918, p. 18; Welsh and Breder, 1923, p. 180.

Head 2.95 to 3.4; depth 2.9 to 3.65; D. X–I, 28 or 29; A. II, 8; scales 64 to 72. Body elongate, compressed; back moderately elevated; head rather long; snout conical, projecting beyond the mouth in the adult and proportionately much longer than in the very young, 2.85 to 3.75 in head; eye 3.35 to 4.8; interorbital 3.35 to 3.8; mouth moderate, horizontal, inferior; maxillary reaching a little past front of eye to below middle of eye, 2.3 to 2.85 in head; teeth in the jaws all small, in broad villiform bands; chin with several pores and a row of short, slender barbels on each side; preopercle with strong, short spines on margin; gill rakers short, 14 to 16 on lower limb of first arch; scales moderate, reduced anteriorly above lateral line, strongly ctenoid, extending on the caudal but not on the other fins; dorsal fins contiguous, or more or less continuous in young, the first composed of slender spines, somewhat elevated, the third and fourth spines longest, higher than any of the rays in the soft part; caudal fin slightly double concave in adult, with the upper and middle rays longest, sharply pointed in very young; anal fin small, with two strong spines, the first very short, the second about two-thirds the length of the soft rays; ventral fins moderate, inserted under and slightly behind base of pectorals; pectorals rather long in adult, reaching well beyond tips of ventrals, scarcely reaching tips of ventrals in young, 1.15 to 1.5 in head.

Color greenish or grayish silvery above, silvery white below, highly irridescent in life; back and sides with numerous brassy or brownish spots arranged in oblique, wavy bars on sides, becoming less distinct in large individuals. Young of about 100 millimeters and less in length do not have the color pattern of the adult, for they are paler; the upper parts bear dark blotches, or mere points, in the very young, these spots becoming vertically elongated when the fish reaches a length of about 80 millimeters; dorsal fins with numerous dark spots; caudal and pectorals greenish dusky; base of pectorals dusky; anal and ventrals yellowish to orange.

Numerous specimens of this common fish, ranging in length from 10 to 355 millimeters (⅜ to 14 inches) in length, were preserved. The principal differences between the young and the adults

have been pointed out in the description. The croaker is most readily recognized by the inferior mouth, the series of short barbels on each side of the chin, and the very strongly serrated preopercle.

In this species both sexes are capable of making a croaking sound. The croaking apparatus, as explained under *Cynoscion regalis*, consists of a pair of croaking muscles and the air bladder. The air bladder is peculiarly modified, for it has two hornlike appendages anteriorly and is slender posteriorly, ending in a sharply pointed, tail-like appendage. The croaking sound may be heard for a considerable distance, and it may be emitted underneath the surface of the water and after the fish is removed from the water.

The croaker, with its inferior mouth and barbels on the chin, is adapted for bottom feeding. The food in Chesapeake Bay, as shown by 392 stomachs examined, consists of the following, named in the order of their apparent importance: Crustaceans, annelids, mollusks, ascidians, ophiurans, and fish. Besides these, considerable sand and vegetable débris were present, which may have been taken incidentally in the capture of food. The first three groups of food named are all important, the other three being represented merely as "traces." It is noteworthy that only three of the croakers examined had fed, in part, on fish. The crustaceans consumed were mostly small or minute, and the mollusks consisted of small bivalves and small gastropods. These data appear to show that the croaker utilizes as food the lower and smaller forms of animal life, which have no

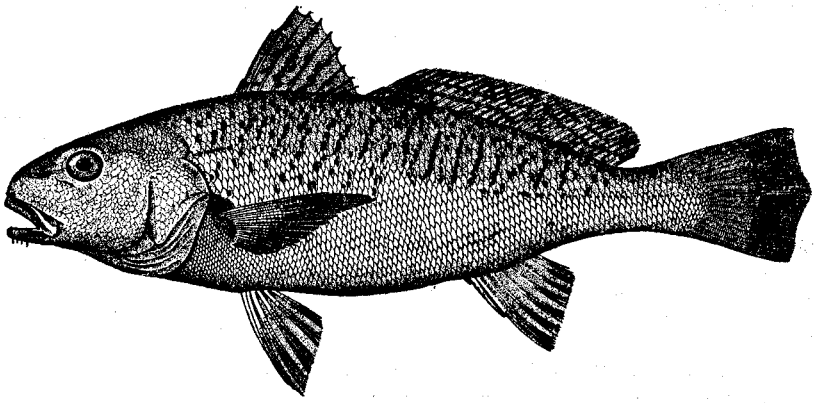

FIG. 164.—*Micropogon undulatus*. From a specimen 12 inches long

direct commercial value and which in large part probably would not serve a useful purpose to man in any other way.

Welsh and Breder (1923, p. 180) state that the spawning season is a long one, extending from August to December, and possibly later in southern waters. No ripe females appear to have been taken in August. These authors, however, base their contention that spawning does take place as early as August upon the fact that on September 12, 1916, fry 32, 36, and 41 millimeters in length were taken in Chesapeake Bay and in New York Bay; fry 22.5, 28, and 29 millimeters in length were taken from September 7 to 21. Fish with well-developed roe were common in Chesapeake Bay during October and the early part of November, which probably is the principal spawning period. The eggs and larvæ of the croaker have not been studied, the smallest individuals known being those at hand, having a total length of about 10 millimeters. In fish of this length most of the fins are already well formed, the mouth is large, and the body is largely unpigmented. The number of eggs produced by a single fish apparently is large. The roe of a female 395 millimeters (15½ inches) long, caught in the mouth of the York River, on October 25, 1921, contained approximately 180,000 eggs of uniform development.

The statement made by Welsh and Breder (1923, p. 180) that spawning extends over a long period of time (August to December) is substantiated in a measure by the large variation in size of young fish taken during the fall and winter months, when many hundreds of specimens were collected, usually with the beam trawl, in the deeper waters of the bay. The young fish were so numerous that occasionally as many as 5 and 6 quarts of fish were taken in a single haul. Speci-

mens taken in October ranged in length from 10 to 105 millimeters (⅖ to 4 inches); in November the range was from 15 to 116 millimeters (⅗ to 4½ inches); in December from 11 to 120 millimeters (⅖ to 4¾ inches); in January, 10 to 110 millimeters (⅖ to 4⅓ inches); and in March from 32 to 64 millimeters (1¼ to 2½ inches). It would appear from these data that spawning continues during at least a part of the winter.

It was found impossible to follow, through measurements, the rate of growth of young fish, even until the age of 1 year was reached. This, no doubt, is due largely to the long spawning period, as pointed out in the preceding paragraph. It is possible that an irregular rate of growth also is maintained, and that would add to the difficulty. Hundreds of fish were measured and length frequencies were plotted with the view of finding breaks, if they existed, upon which growth curves might be based. None were found, and scale studies were not attempted. We are unable, therefore, to give any information relative to the rate of growth.

The croaker is one of the most valuable and abundant food fishes caught in Chesapeake Bay. During 1920 it ranked second in quantity and third in value, the catch being 14,170,385 pounds and the value $393,162.

In Maryland it ranked third in quantity and sixth in value, the catch being 1,130,590 pounds, valued at $31,683. Of this amount, 54 per cent were caught with pound nets, 43 per cent with haul seines and drift nets, 2 per cent with lines, and 1 per cent with fyke nets. Dorchester County is credited with the largest catch, amounting to 380,945 pounds, followed by Calvert, with 279,400 pounds, and Talbot, with 134,800 pounds.

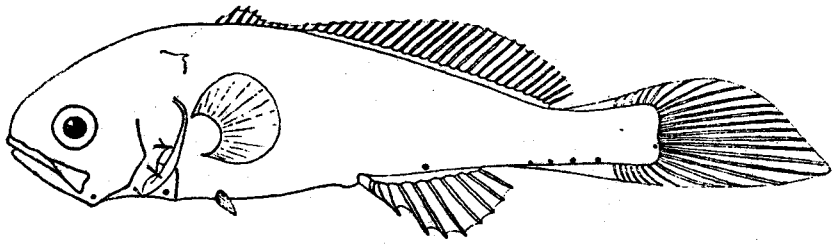

FIG. 165.—*Micropogon undulatus*. Young, 12.25 millimeters long

In Virginia it ranked second in both quantity and value, the catch being 13,039,795 pounds, valued at $361,479. Of this amount, 87 per cent were caught with pound nets, 6 per cent with lines, 3 per cent with drift nets, 2 per cent with haul seines, and 2 per cent with fyke nets. The five counties having the largest catches were Elizabeth City, 4,465,600 pounds; Gloucester, 1,981,300 pounds; Mathews, 1,803,955 pounds; York, 1,552,924 pounds; and Accomac, 1,067,529 pounds.

The croaker is caught in the bay from March until October, a few being taken in the lower part of the bay as late as the beginning of December. For a set of two pound nets at Lynnhaven Roads, Va., the first catch of croakers for each year mentioned is recorded as follows: March 23, 1910; March 29, 1912; April 12, 1916; April 4, 1917; March 21, 1918; March 17, 1919; March 24, 1920; March 15, 1921; March 21, 1922; and March 15, 1923. In the spring they suddenly appear in great numbers, and the bulk of the yearly catch is usually taken during March, April, and May. During 1922 no croakers were caught in the previously mentioned pound nets until March 21, when the first catch consisted of 8,675 pounds, with a catch of 10,400 pounds on the following day.

After about June 10 pound-net catches of croakers take a decided drop, but apparently this does not mean that the fish have left the bay. Although these fish are present during March and April in large numbers, they seldom bite on a hook. In the latter part of May and after June 1 they readily take the hook, however, and are caught in large quantities in that way throughout the summer and fall.

Drift nets are used to advantage in some localities, notably Cape Charles and the lower York and Rappahannock Rivers, Va. This apparatus is used where the bottom is smooth and free of débris. The so-called "drift net" is really nothing but a gill net ranging from about 200 to 400 fathoms in length and 20 feet in depth. It is weighted to such an extent that the tide carries it slowly over the bottom. Buoys placed at intervals indicate the progress of the net to the operators. When not fishing the net is wound on a large wooden reel, which is part of the equipment of the

power boat used in operating the net. Good catches are made by this method when fish are plentiful. Some of the advantages of drift-net fishing are as follows: The outfit is comparatively inexpensive; the boat, with its gear, can be moved from place to place without delay; a crew of two or three men may operate it successfully; and fishing is done directly from the power boat, therefore requiring no dories.

The early run of croakers sometimes is so great that markets are glutted for a time and the price falls to such an extent that it is not profitable to ship the fish. At such times the croakers are either turned out of the nets or kept entrapped in the hope that the market may rise within a few days. Such a glut fortunately does not occur often, and when it has occurred it has been of short duration. The large catches are made during the height of the shad season and for that reason are not looked upon with much favor by the pound-net fishermen.

Losses sometimes are suffered by fishermen because the large catches can not be disposed of profitably when the prolific spring run occurs. During this time the fish often are shipped in carload lots to distant markets, which in turn become glutted. The croaker is a good food fish, and because it is caught in abundance early in the spring when the weather is cool it would appear that the distribution could be extended to new and even more distant markets, where at present it is but little known and where cheap and wholesome fish are scarce. During 1921 and 1922 the wholesale price ranged from $4 to $15 per barrel during most of the season, and the retail prices ranged from 5 to 20 cents a pound, the general average being about 12½ cents.

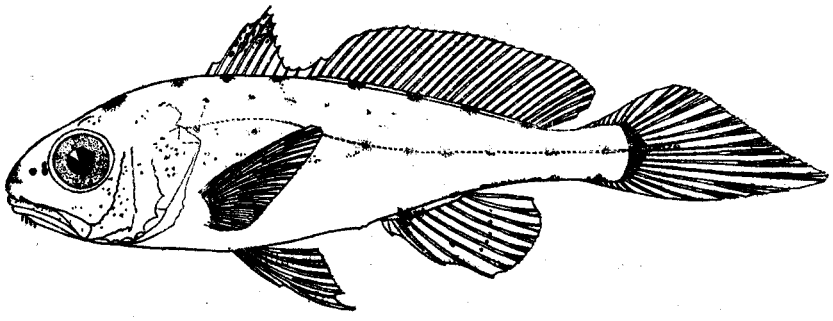

FIG. 166.—*Micropogon undulatus*. Young, 34 millimeters long

The croaker, as already stated, usually appears suddenly in March or April in great abundance, and the first catches are made with pound nets operated near the entrance to the bay. Thereafter the fish appear to migrate gradually up the bay, as the earliest catches at some distance from the entrance always are made somewhat later. The croaker is common throughout the summer in the shallower shore waters. As cool weather arrives, late in September and in October, the fish become scarce along the shores. At this time, however, large fish are abundant in the deeper waters of the lower Potomac, Rappahannock, York, and James Rivers. No adult croakers are taken during the winter by the commercial fishermen in their restricted operations, and, as indicated elsewhere, no large fish occur in our collections, which were made at that season. It is quite certain, therefore, that this fish, like many others, leaves the bay upon the approach of winter.

The names "croaker," "crocus," and "hardhead" are used interchangeably throughout the Chesapeake region. Small fish, less than 10 inches long, are called "pinhead croakers." In the markets of the Chesapeake region the croaker is on sale from late March until late November, and because of its abundance and low price it is one of the most popular of all the food fishes. In quality it is generally considered inferior to the spot, squeteague, and others. Some persons, however, prefer it to almost any other species. The croaker is most abundant in the southern part of the bay, decreasing gradually northward, and above Baltimore County, Md., it is taken only as a straggler.

The size of market fish usually ranges from one-half to 1½ pounds. At times large quantities of "pinhead croakers" (fish 7 to 10 inches long) are caught, and these generally are most common in the spring. On September 18, 1922, a set of two pound nets at Lynnhaven Roads, Va., caught 1,200 pounds of croakers, among which were many fish weighing 3 pounds or more, which is an extraor-

dinary size. The five largest were 19 to 20 inches in length and ranged in weight from 3 pounds 6 ounces to 4 pounds 2 ounces. The last-mentioned fish is the largest recorded from Chesapeake Bay and about the maximum size attained by the species.

Habitat.—Massachusetts to Texas. Not common north of New Jersey.

Chesapeake localities.—(*a*) Previous records: Various parts of the southern sections of the bay. (*b*) Specimens in collection: From many localities, from Baltimore southward. Reported by fishermen as rare north of Baltimore, where it was not seen by us.

Comparison of lengths and weights of croakers

Number of fish weighed and measured	Length	Weight	Number of fish weighed and measured	Length	Weight	
	Inches	*Ounces*		*Inches*	*Pounds*	*Ounces*
4	3	0.2	37	11½		9.5
1	4½	.5	65	12		10.8
1	5	.7	28	12½		12.2
5	5½	1.0	36	13		14.0
12	6	1.3	16	13½	1	0
19	6½	1.6	17	14	1	1.3
27	7	2.0	13	14½	1	3.0
35	7½	2.5	16	15	1	5.0
78	8	3.1	5	15½	1	7.4
58	8½	3.7	6	16	1	9.0
34	9	4.3	3	16½	1	12.8
10	9½	5.3	1	17	2	4.0
18	10	6.2	2	19	3	14.0
19	10½	7.5	2	19½	3	14.0
35	11	8.7	1	20	4	2.0

125. Genus POGONIAS Lacépède. Black drums

Body rather deep; back elevated, ventral outline nearly straight; mouth moderate; the jaws with bands of short teeth; lower pharyngeal bones united, armed with strong paved teeth; chin with numerous small barbels; preopercular margin entire; gill rakers short and blunt; air bladder large, thick, complicated in structure; dorsal fins contiguous, the first with long, slender spines; caudal fin nearly square; second anal spine greatly enlarged. A single species occurs in the North American fauna.

158. Pogonias cromis (Linnæus). Drum; Black drum.

Labrus cromis Linnæus, Syst. Nat., ed. XII, 1766, p. 479; Carolina.
Pogonias cromis Jordan and Evermann, 1896–1900, p. 1482, Pl. CCXXV, fig. 573.

Head 2.9 to 3.45; depth 2.65 to 2.8; D. X–I, 20 to 22; A. II, 6 or 7; scales 41 to 45. Body oblong, compressed; the back much elevated; ventral outline nearly straight; head moderately short; snout blunt, 2.85 to 3 in head; eye 2.85 to 3.95; interorbital 3 to 4; mouth horizontal; lower jaw included, with numerous small barbels, none of them exceeding half the length of eye; maxillary scarcely reaching middle of eye; 2.55 to 2.8 in head; teeth in jaws in broad bands, none of them especially enlarged; preopercular margin entire; gill rakers very short, 14 to 16 on lower limb of first arch; scales firm, ctenoid, reduced in size on head; dorsal fins contiguous, the first with stiff, slender spines, the third spine longest; notably higher than any of the rays in second fin; caudal fin subtruncate; anal fin short, the second spine much enlarged; ventral fins rather large, inserted slightly behind base of pectorals; pectoral fins long, pointed, 3.3 to 3.6 in length.

Color of a 37-inch male, silvery with brassy luster in life, becoming dark gray after death; grayish white below; all fins dusky or black. Color of specimens 7 inches in length, back and sides silvery; dusky white below; sides with four or five vertical black bars; all fins more or less dusky or black, except pectorals, which are plain. The caudal sometimes is plain translucent in young.

This species is represented in the present collection by 17 specimens, ranging in length from 75 to 235 millimeters (3 to 9¼ inches). Larger individuals, weighing upward of 40 pounds, were seen.

The black drum is recognized by the numerous barbels on the chin, the entire preopercle, and the elevated back and straight ventral profile. The young are characterized by four to six broad, black bars on the sides.

The drum, with its subinferior mouth and barbels on the chin, is adapted for bottom feeding. It feeds largely on mollusks and crustaceans, which it is able to crush before swallowing. Schools of this fish are alleged to do great damage to oyster beds at times.

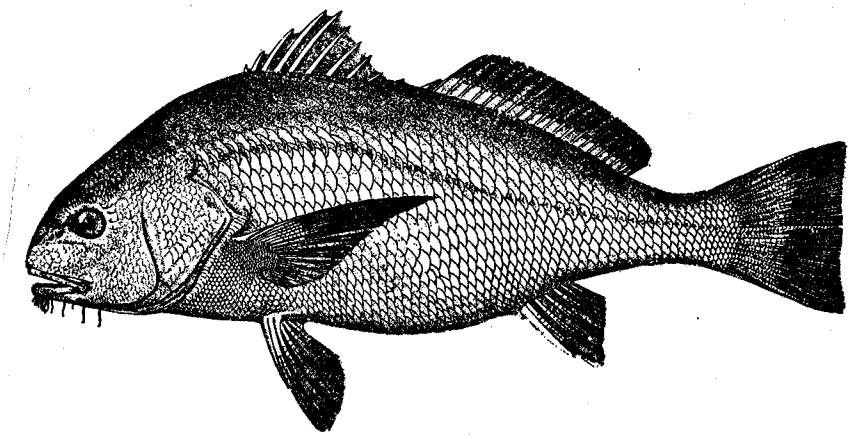

FIG. 167.—*Pogonias cromis.* Adult

Little is known of the life history of the black drum. The eggs and larvæ are undescribed. A fully ripe male, 37 inches long, was caught on May 22, 1922, at Cape Charles, Va., with hook and line, at a depth of 48 feet. Individuals less than 3 inches in length appear to be virtually unknown in collections.

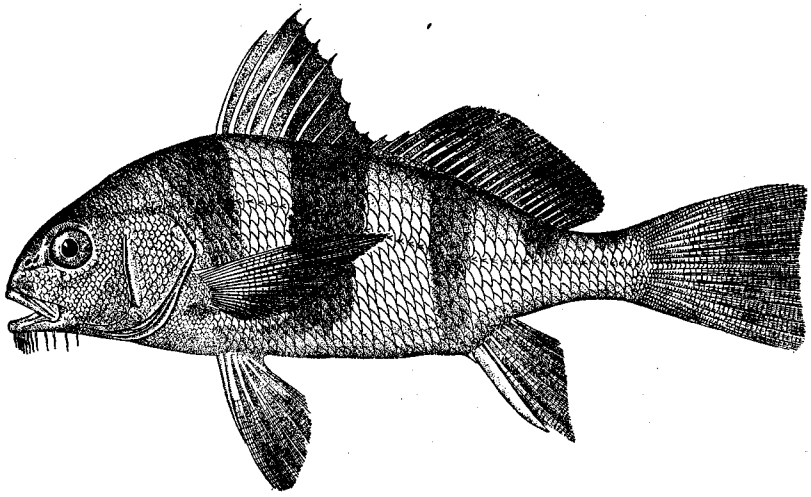

FIG. 168.—*Pogonias cromis.* Young, 10 inches long

Little is known of the rate of growth of the black drum. The smallest specimen, 75 millimeters (3 inches) in length, was taken with a small collecting seine at the mouth of Mill Creek, Solomons Island, Md., August 10, 1921. Other young fish all were taken in late September and during October. In the lower Rappahannock River three black drum, 8 inches long, were caught on October 18, and on October 24, 1921, a 9-inch specimen was taken in the lower Potomac River. During the fall of 1922, at Ocean View, Va., from September 27 to October 27, 20 black drum, rang-

ing in length from 171 to 252 millimeters (6¾ to 10 inches), were caught on nine dates in 32 hauls of 1,800-foot seines.

This fish frequently is infested with parasites, and often is referred to by fishermen as a very "wormy" fish. None of the parasites of this fish, so far as known, are injurious to man, even though they might be eaten; and, furthermore, thorough cooking eliminates all possible chance of infection.

In Chesapeake Bay, during 1920, the black drum ranked twentieth in quantity and twenty-seventh in value, the catch being 23,700 pounds, worth $238.

In Maryland the total catch amounted to 700 pounds, worth $8—the least valuable of all the Maryland commercial fishes.

The catch in Virginia consisted of 23,000 pounds, the majority of which was taken with pound nets in Accomac County.

The black drum is caught from April until December and is most common in May and November. Most of the fish are caught in pound nets, a small number with hook and line, and a few with haul seines. Occasionally a school of fish is entrapped in a haul seine, but this happens less frequently in Chesapeake Bay than along the Atlantic coast.

During the season many individual fish are taken by anglers and fishermen of which no record can be obtained, and owing to their large size the aggregate catch probably is larger than indicated by the statistics collected in 1920.

The black drum is consumed in Baltimore, Crisfield, Norfolk, and other Chesapeake localities. Its value is not sufficient to make shipping to distant markets profitable. During 1921 and 1922 the price received by the fishermen ranged from 1 to 4 cents a pound. At retail, the fish is sold in steaks at 5 to 8 cents a pound. The flesh is coarse and not well flavored.

The names "drum" and "black drum" are used throughout the Chesapeake. The usual size of market fish ranges from 10 to 40 pounds; about 75 pounds is the maximum in the bay. The largest fish of which there is a record weighed 146 pounds and was taken in Florida. The following weights were obtained: Six and three-quarter inches, 2.8 ounces (1 fish); 7¼ inches, 2.9 ounces (2 fish); 7¾ inches, 3.8 ounces (1 fish); 8½ inches, 5.6 ounces (3 fish); 9½ inches, 7 ounces (1 fish); 10 inches, 9.5 ounces (1 fish); 37 inches, 34 pounds (1 fish).

Habitat.—Massachusetts to Argentina; common on the South Atlantic and Gulf coasts of the United States.

Chesapeake localities.—(*a*) Previous records: None. (*b*) Specimens in collection: Solomons, Md., mouth of the Potomac, mouth of the Rappahannock, and Ocean View, Va. Observed at various other localities in the bay from Solomons, Md., southward.

126. Genus UMBRINA Cuvier. Roncadores

Body moderately elongate; back more or less arched; head oblong; snout thick, extending beyond mouth; mouth horizontal, or nearly so; preopercle with a finely serrated bony margin; chin with a single short, thickish barbel; teeth in the jaws in villiform bands; first dorsal with 10 spines; anal fin with 2 spines, the second somewhat enlarged; caudal fin lunate or truncate; gill rakers present but short; air bladder well developed.

159. Umbrina coroides Cuvier and Valenciennes. Roncador.

Umbrina coroides Cuvier and Valenciennes, Hist. Nat. Poiss., V, 1830, p. 187, Pl. CXVII; Brazil. Jordan and Evermann, 1896-1900, p. 1466.

Head 3.55; depth 3.3; D. X–I, 29; A. II, 6; scales 58. Body elongate, compressed; back moderately elevated; head rather short; snout conical, projecting beyond the mouth, 3.3 in head; eye 2.9; interorbital 3.3; mouth moderate, inferior, horizontal; maxillary reaching under middle of eye, 2.55 in head; teeth in jaws small, in villiform bands; chin with a very short, thickish barbel; preopercular margin serrate; gill rakers about 11 on lower limb of first arch; scales rather small, ctenoid; dorsal fins continuous but deeply notched, the first with rather weak flexible spines; caudal fin injured, probably more or less rounded; anal fin very small, the second spine rather long and strong, 2.2 in head; ventral fins moderate, inserted under and a little posterior to pectoral fins; pectoral fins rather short, not reaching tips of ventrals, 1.45 in head.

Color of preserved specimen brownish above, lower parts silvery; sides with about nine dark crossbars; fins mostly plain, the dorsals and caudal with dusky punctulations.

A single specimen of this species, 50 millimeters (2 inches) in length, which is new to the fauna of Chesapeake Bay, was obtained. This fish differs in several respects from specimens (4 examined) from the Atlantic coast of Panama. The fish from Chesapeake Bay has 29 rays in the second dorsal, 58 transverse series of scales above the lateral line, and 11 gill rakers on the lower limb of the first arch. The Panama fish have 24 or 25 rays in the soft dorsal, 46 to 50 scales (enumerated in the same way as for the local specimen), and 5 or 6 gill rakers on the lower limb of the first arch. The smallest Panama fish is 160 millimeters (6½ inches) in length. The size, therefore, is too unequal to show comparative differences in the shape and proportions of the body, etc., if, in fact, they exist. *U. coroides* originally was described from Brazil, and although specimens from Florida and elsewhere have been considered identical with the Brazilian fish, the specimens in hand appear to show that two species may have been included. The doubtful form, *U. broussonetii* Cuvier and Valenciennes, may possibly prove to be a valid species. The material at hand, however, is too meager to show definitely the relationship. The Chesapeake Bay specimen, therefore, is tentatively referred to *U. coroides*.

The species is not known to be of much commercial value anywhere within its range and probably does not attain a large size. The largest individual seen by one of us (Hildebrand) at Colon, Panama (where the species is occasionally taken), was only 8 inches long.

Habitat.—Florida to Brazil, now for the first time recorded northward of Florida.

Chesapeake localities.—(*a*) Previous records: None. (*b*) Specimen in collection; Lynnhaven Roads, Va.; taken with seine on a sandy beach, September 27, 1921.

127. Genus MENTICIRRHUS Gill. Whitings

Body elongate, little compressed; head rather long; snout conical, projecting beyond the mouth; mouth small, horizontal; teeth in jaws in bands; a single barbel at chin; gill rakers very short; first dorsal with 10 or 11 slender spines; anal with a single weak spine; air bladder absent.

KEY TO THE SPECIES

a. Scales on the chest not reduced and not notably smaller than on sides; pectoral fins reaching to or beyond tips of ventrals.

b. Sides normally with dark, oblique bars, the last one on nape and the first one on body, meeting and forming a V; soft rays of anal usually 8, sometimes 9; longest dorsal spine produced, reaching far beyond origin of second dorsal in adult, 3.1 to 3.85 in length; scales 91 to 96, counting vertical series above lateral line.....*saxatilis*, p. 290

bb. Sides plain or with obscure dark bars, not forming a V on sides; soft rays of anal usually 7, rarely 8; none of the dorsal spines produced in adult, the longest not reaching far beyond origin of soft dorsal 4.95 to 5.95 in length; scales 86 to 90, counting vertical series above lateral line.....*americanus*, p. 291

aa. Scales on chest much reduced, notably smaller than on sides; pectoral fins failing conspicuously to reach tips of ventrals; none of the dorsal spines produced, the longest 5.3 to 6.45 in length in adults; soft anal rays typically 7; scales 72 to 74, counting vertical series above lateral line; coloration plain silvery gray.....*littoralis*, p. 294

160. Menticirrhus saxatilis (Bloch and Schneider). "Kingfish"; "Roundhead"; "Sea mullet"; "Sea mink"; Whiting; King whiting.

Johnius saxatilis Bloch and Schneider, Syst. Ichth., 1801, p. 75; New York.
Menticirrhus nebulosus Lugger, 1877, p. 78; Smith, 1892, p. 72.
Menticirrhus saxatilis Jordan and Evermann, 1896-1900, p. 1475; Smith and Bean, 1899, p. 187.

Head 3.05 to 4.1; depth 3.65 to 4.3; D. X–I, 24 to 26; A. I, 8 (sometimes I, 9); scales 91 to 96 (counting vertical series between enlarged scale at upper angle of opercle and base of caudal). Body elongate, compressed; back elevated; ventral outline nearly straight; head low; snout conical; projecting beyond the mouth, 2.9 to 3.5 in head; eye 2.8 to 4.6; interorbital 3.5 to 4.45; mouth horizontal, inferior; chin with a single short, thickish barbel; maxillary reaching opposite middle of

eye, 1.35 to 2.85 in head; teeth in the jaws in bands, the outer ones in upper jaw somewhat enlarged; preopercle serrate; gill rakers very short, about six more or less developed on lower limb of first arch; scales small, firm, strongly ctenoid, not reduced in size on the breast; dorsal fins contiguous, the first with slender, flexible spines, the third one produced in the adult, reaching far beyond the anterior soft rays when deflexed, 3.1 to 3.85 in length in specimens 140 to 285 millimeters long; soft dorsal rather long and low; caudal fin with concave upper lobe and somewhat produced lower lobe, proportionately longer in young than in adult; anal fin moderate, with a single slender spine; ventral fins rather short, inserted about a half an eye's diameter behind base of pectorals; pectoral fins reaching to or a little beyond tips of ventrals, 1 to 1.45 in head.

Color dusky above, silvery underneath; some specimens much darker than others; sides with oblique bars running upward and backward; a horizontal stripe extending to end of lower lobe of caudal, often present on posterior part of body; two bars at nape running upward and forward, the second of these forming a V with the first bar on body; these markings are obscure on some individuals, often present on young as small as 30 millimeters in length; pectorals and spinous dorsal mostly black; other fins plain to dusky, varying among individuals.

Many specimens, ranging in length from 18 to 285 millimeters (¾ to 11¼ inches), were preserved. The fishermen do not distinguish this fish from others of the genus and they are not separated in the market. The color markings, forming a dark or black V on anterior part of sides, usually distinguishes this species from its relatives in Chesapeake Bay. In the adult the produced third dorsal spine, which reaches far beyond the beginning of the second dorsal, separates this species from its relatives. Other small but constant differences appear to exist in the size of the scales and number of fin rays. The young do not differ greatly from the adults, as indicated in the description.

Among 10 individuals, 9 had fed exclusively on crustaceans ranging in size from copepods to fairly large shrimp. One individual had fed on a squid.

The eggs of this whiting were obtained and hatched by Welsh and Breder (1923, p. 190). These authors, working at Atlantic City, N. J., state that spawning commences in June and continues until August. The eggs are reported to have an average diameter of 0.8 to 0.85 millimeter, being almost colorless, floating in sea water, and hatching in 46 to 50 hours in a water temperature of 68° to 70° F. The newly hatched fish were 2 to 2.5 millimeters in length.

Young *M. saxatilis* were collected throughout the summer and fall, often in company with young *M. americanus*. Fish 16 millimeters in length were taken late in June. By late September the size ranged from 35 to 154 millimeters (1⅖ to 6 inches). During October fish 50 to 185 millimeters (2 to 7¼ inches) were caught in the lower bay, and at the same time another size group, which ranged from 8½ to 11 inches in length, was present. All of the fish listed, with the exception of the last group, quite probably were the product of the previous spring and summer hatch. The group mentioned last no doubt consisted of older fish.

This species is included in the discussion of commercial importance of the whiting, under *M. americanus*. The exact proportion of each species comprising the total catch is not known. *M. saxatilis*, however, is said to attain its greatest abundance north of Chesapeake Bay.

The maximum size is about 3 pounds, but market fish usually range from ½ to 1½ pounds in weight.

Habitat.—Cape Cod, Mass., to Florida; rarely northward to Casco Bay, Me.

Chesapeake localities.—(*a*) Previous records: Southern part of Chesapeake Bay, mouth of the Potomac, Gunston Wharf, Va. (*b*) Specimens in collections: Crisfield, Md., Lower York River, Cape Charles, Buckroe Beach, Ocean View, and Lynnhaven Roads, Va.

161. Menticirrhus americanus (Linnæus). "Kingfish"; "Roundhead"; "Sea mullet"; "Sea mink"; Whiting; King whiting.

Cyprinus americanus Linnæus, Syst. Nat., ed. X, 1758, p. 321; Carolina.
Menticirrhus alburnus Uhler and Lugger, 1876, ed. II, p. 101; Bean, 1891, p. 89.
Menticirrhus americanus Jordan and Evermann, 1896–1900, p. 1474, Pl. CCXXV, fig. 572; Evermann and Hildebrand, 1910, p. 162; Fowler, 1918, p. 18.

Head 3.1 to 3.9; depth 3.56 to 4.1; D. X–I, 24 to 27; A. I, 7 (rarely I, 8); scales 86 to 90 (counting vertical series between enlarged scale at upper angle of opercle and base of caudal). Body elongate, compressed; back elevated; ventral outline nearly straight; head low; snout

conical, projecting beyond the mouth, 3.1 to 4.15 in head; eye, 2.8 to 6.5; interorbital 3.1 to 4.4; mouth horizontal, inferior; chin with a single, short, thickish barbel at symphysis; maxillary reaching opposite middle of eye, 2.5 to 2.9 in head; teeth in bands in each jaw, the outer ones in upper jaw enlarged; preopercle serrate; gill rakers very short, only about six somewhat developed on lower limb of first arch; scales rather small, firm, strongly ctenoid, not reduced in size on the breast; dorsal fins contiguous, the first composed of slender, flexible spines, none of them produced, and not extending far beyond the anterior soft rays when deflexed, the longest one 4.95 to 5.95 in

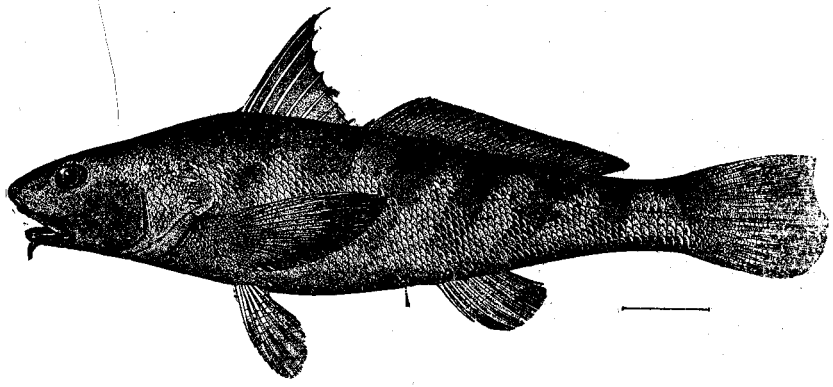

FIG. 169.—*Menticirrhus americanus*

length in specimens 130 to 293 millimeters long; soft dorsal rather long and low; caudal fin with concave upper lobe and produced, pointed lower lobe, this lobe proportionately longer in the young than in the adult; anal fin rather short, with a single rather weak spine; ventral fins rather small, inserted behind base of pectorals; pectoral fins rather large, reaching to or beyond tips of ventrals, 1.05 to 1.55 in head.

Color of two specimens, 11½ and 12½ inches long, silvery gray above; white below, with dusky markings; sides with seven to eight obscure dark bars, the one at nape and the one on caudal peduncle darkest and most persistent; spinous dorsal plain, membranes edged with black from first to sixth spine on one fish and from second to seventh spine on the other; soft dorsal plain, some of rays tipped with black; caudal dusky, with light brown on upper part; anal and ventrals white faintly marked with light brown; pectorals dusky or black. In some specimens the dark bars

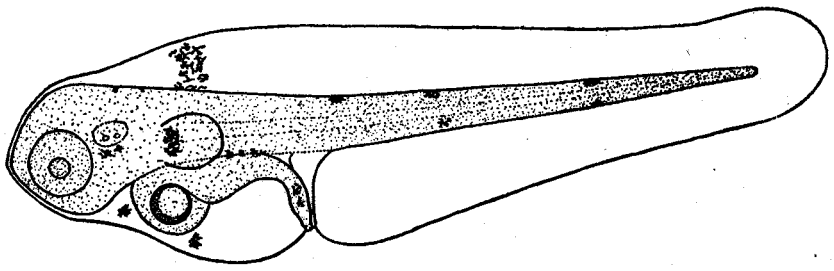

FIG. 170.—Recently hatched larva, 26.5 millimeters long

along back and sides are wanting and the belly may be plain white instead of with grayish or dusky markings. Young rather darker than the adults; the back and sides with dusky punctulations and sometimes with blackish blotches. The fin colors of 13 young, 80 to 135 millimeters (3⅛ to 5⅜ inches) in length, were as follows: Spinous dorsal slightly dusky; soft dorsal nearly plain, sometimes slightly dusky, in one specimen tinged with yellow brown; caudal slightly dusky, tinged with yellowish brown; anal, ventrals, and pectorals slightly dusky, sometimes white, tinged with yellowish brown. Two specimens of *M. saxatilis*, 77 and 128 millimeters (3 and 5 inches) in length,

besides having dark V-shaped body markings, differed chiefly in the more dusky coloration of the two dorsals and the pectorals.

Many specimens ranging in length from 22 to 393 millimeters (⅞ to 15½ inches) were preserved. This fish usually is readily distinguished from *M. saxatilis* by the plainer coloration. Some specimens of *saxatilis*, however, are so obscurely marked that other characters must be relied upon for identification. The alleged difference in the number of soft rays in the second dorsal, mentioned in current descriptions, does not appear to exist. In 22 specimens of *M. americanus* examined for this character, five had 24 rays, sixteen had 25, and seven had 26. The number of anal rays is of some value, however, as *M. americanus* typically has 7, rarely 8, rays in the anal fin, and *M. saxatilis* typically has 8, rarely 9, rays. The longest dorsal spine in the adult in *americanus* is never as high as in *saxatilis*, and the scales are somewhat larger. *M. americanus* is most readily separated from *M. littoralis* by the size of the scales on the chest, which in *americanus* are scarcely smaller than the scales elsewhere on the body, whereas in *littoralis* they are notably reduced in size. The smallest specimens (22 millimeters) at hand do not differ notably from the adults except in color, as shown in the description, and in the proportionately longer and more pointed lower lobe of the caudal fin.

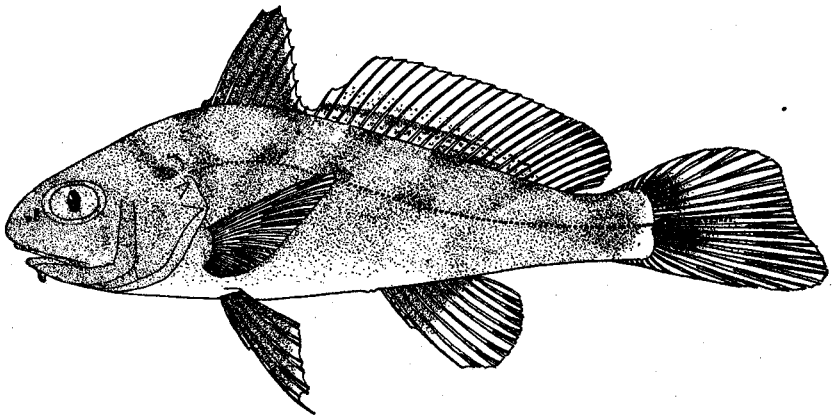

FIG. 171.—Young, 39 millimeters long

The food of this fish, as shown by the contents of 21 stomachs taken from specimens collected in Chesapeake Bay, consists of crustaceans and fish, the two foods being present in the proportion of about 85 per cent crustaceans (chiefly shrimp) and 15 per cent fish.

The spawning habits of this fish are not well known, and the eggs and larvæ have not been studied. Smith (1907, p. 332) states that this fish spawns in June at Beaufort, N. C. Welsh and Breder (1923, p. 186), however, found no ripe or spent fish on the coast of New Jersey as late as August, 1920, and these authors produce some evidence indicating that the fish probably spawns in the fall in the Gulf of Mexico. It is evident, therefore, that the information is far from complete.

On May 20, 1922, two ripe males, 286 and 310 millimeters (11¼ and 12¼ inches) in length, were trawled off Cape Charles, and on the following day a number of males and females, 11 to 12¼ inches long, with well-developed gonads, were seined along the beach at Cape Charles.

On June 11, 1921, many of the fish in the Norfolk market contained nearly ripe eggs, while some apparently had already spawned. The presence of ripe males in May and of nearly ripe males and females, together with spawned-out fish, in June, followed by the presence of young, three-fourths inch or more in length, early in the summer, indicates that this species spawns in Chesapeake Bay during the spring and probably early summer.

The commercial catch of kingfishes in the Chesapeake includes three species (*M. americanus*, *M. littoralis*, and *M. saxatilis*) which resemble each other so closely that they are not separated by the fishermen. However, one species (*M. americanus*) is more abundant than the others. The statistics that follow include all three species.

In Chesapeake Bay, during 1920, the kingfishes ranked twenty-first, both in quantity and value, the catch being 17,933 pounds, worth $1,606.

During 1920 the kingfishes were not taken in Maryland in commercial quantities. The catch, therefore, is credited entirely to Virginia. Considered among the fishes of Virginia, the kingfishes ranked twentieth in quantity and nineteenth in value. Of the total catch, 47 per cent were caught with lines, 30 per cent with pound nets, and 23 per cent with seines. The counties with the largest catches were Princess Anne, 6,600 pounds; Norfolk, 4,700 pounds; and Elizabeth City, 4,700 pounds.

The kingfishes are caught from April until November, the bulk of the catch being taken in the spring and late fall. Records obtained from a set of two pound nets at Lynnhaven Roads, Va., give the earliest catches as follows: April 21, 1916; April 17, 1917; April 16, 1918; April 22, 1919; April 16, 1920; April 27, 1921; and April 11, 1922. The table on page 32 gives the monthly catch for the years 1916 to 1922, taken in the same set of two pound nets situated in the same part of Lynnhaven Roads for the entire period.

According to this record, the catch of kingfish has been declining steadily since 1917, with a slight rise in 1922. The pound nets upon which this catch is based, because of their large size and peculiar location, probably yield more of this species than any other single set of apparatus in the bay. Because of this fact and the long period of time involved it is believed that these records indicate the general trend of abundance for the kingfishes in the Chesapeake.

The kingfishes are taken with haul seines in small quantities from time to time during the summer and fall, but they are not abundant enough to support a special fishery. A few are taken with gill nets of a type known as the drift net. The drift net is sunk to the bottom by weights and is employed chiefly to catch croakers and striped bass. The kingfish bites freely on hook and line during the summer and fall, and the aggregate catch taken by anglers is rather large.

This species is essentially a fish of the lower sections of the bay, but it sometimes is taken in small numbers as far north as Solomons, Md. However, it is rare above Solomons, and occurs only as a straggler at Love Point, Md.

Most of the catch is marketed in Baltimore and the vicinity of Norfolk, but occasionally when a good catch is made it is shipped to New York, where a good price usually is obtained. During 1920, 1921, and 1922 the price received by the fishermen was about 9 cents per pound, whereas the retail price ranged from 15 to 25 cents. During recent years these fish have not been caught in sufficient numbers to overstock the local markets, and the demand, although rather small, is constant.

Various names have been assigned to these fish in the Chesapeake, the most common being "kingfish" and "round head." They are sometimes called "sea mullet," "sea mink," or "whiting." To avoid confusion with the Florida kingfish (Scomberomorus) and the New England whiting (Merluccius), the name "king whiting" has been proposed.

The kingfishes are high-quality food fishes and are much esteemed by those who are well acquainted with them. For some reason they are not as well known generally as several other species that they surpass in quality.

The weight of market fish ranges from ½ to 1½ pounds and the maximum is 2½ pounds.

The following comparisons of length and weights of fresh fish may be of interest: Length 4 to 4⅞ inches (7 fish), average weight 0.4 ounce; 5 to 5⅞ inches (5 fish), 0.85 ounce; 6½ inches (11 fish), 1.8 ounces; 7½ inches (1 fish), 2.1 ounces; 9 inches (1 fish), 3.8 ounces; 11 to 11⅞ inches (9 fish), 7.45 ounces; 12 to 12¾ inches (6 fish), 10 ounces; 13 inches (1 fish), 11 ounces; 14½ inches (2 fish), 17.2 ounces; 15 inches (1 fish), 20.6 ounces; and 16½ inches (1 fish), 30 ounces.

Habitat.—New York to Texas; common from Chesapeake Bay southward.

Chesapeake localities.—(*a*) Previous records: St. George Island, Md., Cape Charles city and Ocean View, Va. (*b*) Specimens in collection: From various localities, from Solomons, Md., southward.

162. Menticirrhus littoralis (Holbrook). "Kingfish"; "Roundhead"; "Sea mullet"; Whiting; Surf whiting; Silver whiting.

Umbrina littoralis Holbrook, Ichth., South Carolina, ed. I, 1855, p. 142, Pl. XX, fig. 1; South Carolina.
Menticirrus littoralis Jordan and Evermann, 1896-1900, p. 1477.

Head 3.45 to 3.75; depth 3.6 to 4.35; D. X–I, 24 to 26; A. I, 7; scales 72 to 74 (counting vertical series between the enlarged scale at upper angle of gill opening and base of caudal). Body elongate,

compressed; back elevated; ventral outline nearly straight; head low; snout conical, projecting beyond mouth, 2.9 to 3.25 in head; eye 3.1 to 4.1; interorbital 3.6 to 4.7; mouth horizontal, inferior; chin with a single, short, thickish barbel; maxillary reaching nearly or quite opposite middle of eye, 2.6 to 3.05 in head; teeth in the jaws in bands, none of them especially enlarged; preopercle serrate; gill rakers very short, seven or eight more or less developed on lower limb of first arch; scales rather large, firm, strongly ctenoid, notably reduced in size on the chest; dorsal fins contiguous; the first composed of slender, flexible spines, none of them produced, the longest scarcely reaching the origin of the second dorsal when deflexed, 5.3 to 6.45 in length in specimens 100 to 160 millimeters long; second dorsal rather long and low; caudal fin with concave upper lobe and pointed lower lobe, more produced in the young than in the adult; anal fin small, with a single weak spine; ventral fins moderate, inserted fully half an eye's diameter behind base of pectorals; pectoral fins short and broad, not nearly reaching tips of ventrals, 1.3 to 1.55 in head.

Color silvery gray above, paler below; sides without dark markings; fins mostly pale; the spinous dorsal and the lower lobe of the caudal usually with more or less dusky. Very young (60 millimeters and less in length) with dusky punctulations; the punctulations sometimes concentrated, forming dusky blotches on the back and two on base of caudal.

Many specimens, ranging from 22 to 160 millimeters (⅞ to 6¼ inches) in length, were preserved. All except the very young are readily separated from other species of Menticirrhus by the

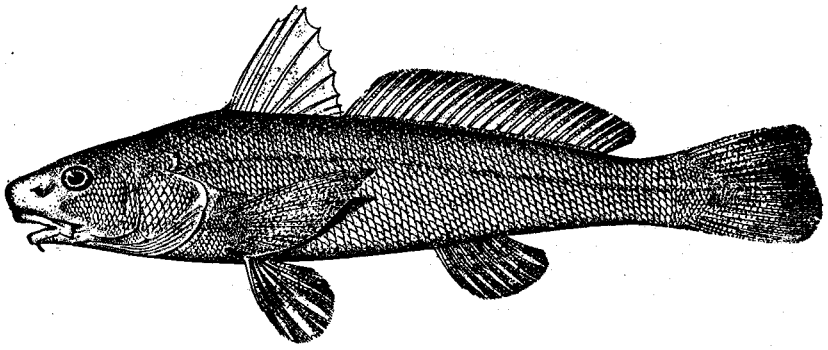

FIG. 172.—*Menticirrhus littoralis*

greatly reduced scales on the chest. The scales in this fish are somewhat larger, and the length of pectorals, as compared with the length of the ventrals, is less. All of these characters are rather difficult of application in the very young, which are separated from *M. americanus* not without trouble. The young differ from the adults chiefly in color and in the longer and more pointed lower lobe of the caudal.

The food of this species appears to be identical with that of *M. saxatilis*. Seven stomachs examined contained crustaceans only.

The eggs and also the young, smaller than the smallest ones at hand, have not been described. Smith (1907, p. 324) states that he took ripe fish in June at Cape Lookout; also that ripe eggs have been taken on several occasions between June 1 and June 10 at Beaufort, N. C.

The species apparently has not been recorded previously from Chesapeake Bay. It was not distinguished from *M. americanus* in the field. Judging from the number of specimens obtained, it probably is the least abundant of the three species occurring in Chesapeake Bay. Whether or not this southern species of whiting is taken in commercial numbers in Chesapeake Bay can not be stated here for the reason already stated—that the species was not recognized in the field.

Habitat.—"South Atlantic and Gulf coasts; rarely, if ever, straying north of North Carolina" (Smith, 1907). Now apparently for the first time recorded from Chesapeake Bay.

Chesapeake localities.—(*a*) Previous records: None. (*b*) Specimens in collections: Buckroe Beach, Ocean View, and Lynnhaven Roads, Va.

Family LXX.—OTOLITHIDÆ. The weakfishes.

This family, according to Jordan (1923, p. 202), differs from the Sciænidæ principally in the different arrangement of the vertebræ, the Sciænidæ having typically 10+14 vertebræ, whereas the present family has 14+10. A single genus of the Chesapeake Bay fauna falls within the scope of the Otolithidæ.

128. Genus CYNOSCION Gill. Squeteagues; "Sea trouts"

Body elongate; head conical; mouth large, oblique; lower jaw protruding; teeth sharp, not protruding, two enlarged, recurved teeth at tip of upper jaw; no enlarged teeth on lower jaw; preopercle serrate; pseudobranchiæ present; dorsal spines slender, flexible; second dorsal long and low, more than twice the length of the anal; anal spines 2, very weak.

KEY TO THE SPECIES

a. Soft dorsal and anal scaleless; gill rakers comparatively short, eight on lower limb of first arch; 11 or 12 scales in a series between the origin of the anal and the lateral line; body with round black spots ..... *nebulosus*, p. 296

aa. Soft dorsal and anal usually closely scaled; body not spotted with round black spots.

b. Anal fin with nine soft rays; gill rakers few, nine on lower limb of first arch; eight scales in a series between origin of anal and lateral line; coloration nearly uniform ..... *nathus*, p. 299

bb. Anal fin with 11 or 12 soft rays; gill rakers more numerous, 11 to 13 on lower limb of first arch; 10 scales in a series between the origin of the anal and the lateral line; body usually with irregular dark blotches, sometimes forming wavy, oblique lines ..... *regalis*, p. 300

163. Cynoscion nebulosus (Cuvier and Valenciennes). Spotted weakfish; Spotted squeteague; "Salmon trout"; "Simon trout"; "Spotted trout"; "Speckles"; "Speckled trout".

Otolithus nebulosus Cuvier and Valenciennes, Hist. Nat. Poiss., V, 1830, p. 79; locality unknown.
Cynoscion carolinensis McDonald, 1882, p. 12, fig. 2.
Cynoscion maculatus Bean, 1891, p. 88; Smith, 1892, p. 72.
Cynoscion nebulosus Jordan and Evermann, 1896-1900, p. 1409, Pl. CCXXI, fig. 563; Evermann and Hildebrand, 1910, p. 162; Fowler, 1912, p. 58; and 1918, p. 18; Welsh and Breder, 1923, p. 164.

Head 2.95 to 3.25; depth 3.4 to 4.35; D. X (rarely XI)–I, 24 to 26; A. II, 10 or 11; scales 90 to 102. Body elongate, somewhat compressed; back little elevated; head long and low; snout pointed, 3.75 to 4.2 in head; eye 4.45 to 5.35; interorbital 4.5 to 5.9; mouth large, oblique; lower jaw projecting; maxillary reaching nearly or quite opposite posterior margin of eye, 2.2 to 2.3 in head; teeth as in *C. regalis;* gill rakers rather short, 8 on lower limb of first arch; scales small, thin, ctenoid, extending forward on head, cheeks, and opercles, not present on fins, 11 or 12 between origin of anal and lateral line; dorsal fins contiguous or separate, spines of the first weak, flexible, the longest spines scarcely longer than the longest soft rays; caudal fin pointed in very young, becoming straight to somewhat emarginate in adults; anal fin small, the spines very weak, base of fin ending about an eye's diameter in advance of end of base of dorsal; ventral fins rather small, inserted a little behind base of pectorals, 1.85 to 2.25 in head.

Color dark gray above, with sky-blue reflections; pale, silvery below; upper part of sides marked with numerous round, black spots, the spots extending on dorsal and caudal fins. Very young with a broad, dark, lateral band; blotches of the same color on the back; base of caudal black. Fins pale to yellowish green; the dorsal and caudal spotted with black in the adult.

Many specimens of this common species, ranging in length from 25 to 245 millimeters, were preserved. The very young of this squeteague differ very markedly from the adult in color, as shown in the description, also in the more or less sharply pointed tail and other less striking characters. Individuals 5 inches and upward in length are readily distinguished from related species by the round, black spots situated on the upper parts of the body and on the dorsal and caudal fins. The scales, also, are smaller and are wanting on all the fins.

The food of the spotted squeteague appears to be identical with that of the gray squeteague. The contents of 20 stomachs consisted of fish and crustaceans, the large individuals having fed mainly on fish and the small ones on crustaceans.

Virtually nothing is known of the spawning habits of this fish, and fish with large roe seldom are seen. From the meager data at hand, it is believed to spawn in the spring, probably in May and June. Yarrow observed, at Beaufort, N. C., that females had quite large roe in April. (Smith, 1907, p. 312.) No ripe fish were seen in the Chesapeake region. A male 14 inches long, taken on July 22, and a female 19 inches long, taken on September 26, had gonads in such a state of development that they probably would have matured the following spring. It seems probable, because of the rather large number of young (small) fish taken, that this squeteague may spawn within Chesapeake Bay.

The rate of growth of the spotted squeteague is equally as little known as the spawning habits. Very young fish are rare in collections, and the smallest ones at hand, having a length of only 25 millimeters, are among the smallest that have been studied.

The following record of catches of young fish made in the Chesapeake are given in the hope that they may prove of value in future studies of the rate of growth of this species. It is perhaps noteworthy that all except the first specimen listed were taken north of the mouth of the Potomac River—Rappahannock River, one specimen, 75 millimeters long, taken on July 23; Solomons Island 52 fish, Chesapeake Beach 43 fish, Annapolis 2 fish, all taken from August 9 to 18, range in length 25 to 75 millimeters; Love Point and Oxford, 6 and 8 fish, respectively, taken from September 5 to 13, range in length from 51 to 89 millimeters.

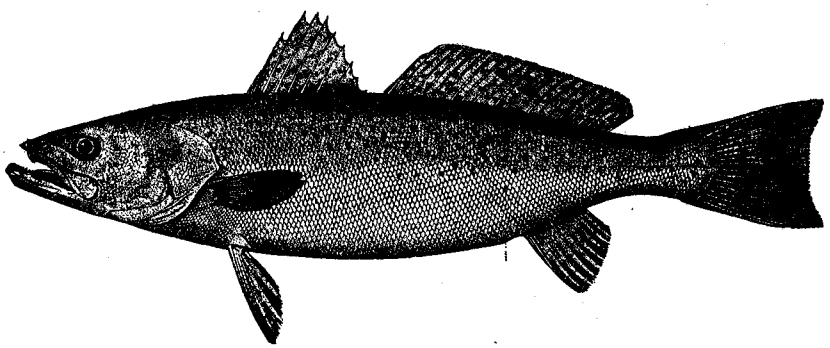

FIG. 173.—*Cynoscion nebulosus*

The spotted squeteague is one of the important food fishes of Chesapeake Bay. During 1920 it ranked ninth in quantity and eighth in value, the catch being 438,797 pounds, worth $43,879.

In Maryland it ranked thirteenth in quantity and eleventh in value, the catch being about 20,000 pounds, worth $2,000. The catch is about equally divided between the haul seines and the many pound nets found within the State.

In Virginia it ranked seventh in quantity and eighth in value, the catch being 418,797 pounds, worth $41,879. Of this amount, 53 per cent were caught with haul seines, 34 per cent with pound nets, 8 per cent with fyke nets, and 5 per cent with gill nets. Norfolk County was credited with the largest catch, 115,640 pounds, followed by Northampton with 94,077 and York with 67,845 pounds.

The spotted squeteague is caught in the Chesapeake from March until December, including two definite shorter periods of abundance—namely, from March until May and from September until November. This fish is not taken in large quantities in pound nets. Small numbers, however, are taken in nearly every pound, and the aggregate catch of the many traps forms a large portion of the total catch of this species. Most of the pound-net catch is taken in March, April, and May. A scattering few are taken during the summer, the catch increasing slightly in the fall. Quantities of this fish are caught by numerous fyke nets located in the lower parts of the larger rivers. It is also taken in small numbers with gill nets, principally about Tangier Island, Great Fox Island, and Pocomoke Sound. The largest part of the catch is taken with haul seines and set seines. A special fishery is carried on in the fall with the last-mentioned apparatus.

Spotted squeteague are caught incidentally with the haul seine along with spots, croakers, etc. The set seines, however, are employed chiefly for the spotted squeteague. During 1922, four set

seines were operated in Chesapeake Bay, all located between Ocean View and Lynnhaven Inlet, Va. A set seine is similar to a haul seine, being more heavily leaded, however, and more closely corked. With one end lying on the beach, it is set out from the shore in nearly a perpendicular line, and at the outer end a 300-pound anchor is fastened. Between this anchor and the shore a number of 40-pound anchors are attached to the lead line, for the purpose of holding the seine in place. When the tide changes, these small anchors must be adjusted to avoid entanglement with the seine. Several fishermen remain in the immediate locality, while the net is set, and adjust anchors and otherwise observe the gear. The net is hauled ashore at slack, low tide, once in 24 hours. This is done by attaching a line to the outer end of the seine, and it is hauled to shore by making a semicircular sweep. A power winch, operated by a gasoline engine, is employed for this purpose. After the outer end has reached the shore, the procedure is similar to haul seining (described under *Leiostomus xanthurus*). The set seine is usually about 1,500 to 1,800 feet long, 14 to 25 feet deep, and of 1⅛ to 1½ inch bar mesh. A crew of 12 to 15 men is necessary to operate the net successfully. The fish do not gill themselves in the set seine but have a peculiar habit of lying close against the seine, near the lead line, and in this position they remain dormant for hours during the cool fall weather.

The relative efficiency of the set seine and the haul seine for catching this squeteague is illustrated by the following records, made from a series of hauls of both kinds of seines made near Ocean View, Va. These data are based upon the catches made by two haul seines and one set seine and represent the total of all the hauls observed. The catch taken with the set seine from Septem-

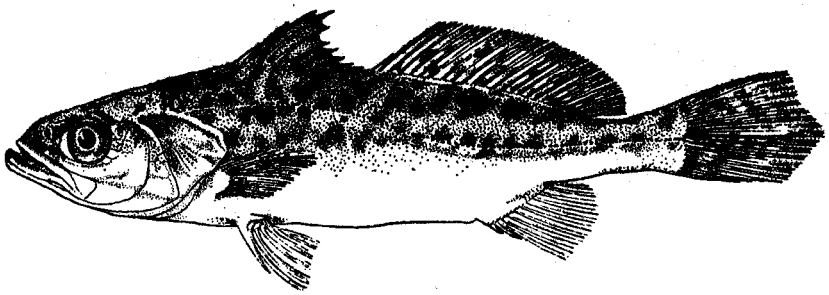

FIG. 174.—*Cynoscion nebulosus*. Young, 12 millimeters long

ber 26 to October 27, 1922, in a total of 15 hauls, consisted of 11,216 fish; average number of fish per haul, 747; average weight per fish, 2¼ pounds; weight of largest fish, 7½ pounds. The catch taken with two haul seines from September 23 to October 27, 1922, in a total of 33 hauls, consisted of 749 fish; average number of fish per haul, 23; average weight per fish, 1½ pounds; weight of largest fish, 6 pounds.

The first seine catches are made in the lower part of the bay about September 15, and continue until cold weather arrives. The spotted squeteague apparently leave the bay in the fall for a more southern habitat, and it is during this outward migration that they are intercepted by the fishermen's nets. This squeteague, like *C. regalis*, is rare in the bay north of Annapolis, and the fishing season is shorter in the upper stretches of the bay than near the entrance.

The spotted squeteague is always in demand in the fish markets, where it brings a good price at all seasons. During 1921 and 1922 the retail prices usually ranged between 25 and 30 cents per pound. In the fall it is shipped to Baltimore, Washington, New York, and other markets. Its fine appearance, firm flesh, and good flavor place this fish in high esteem.

Many names have been given to this species. In the Chesapeake region only a few are in common use, "speckles," "speckled trout," "Simon trout," and "salmon trout" being used interchangeably.

The largest fish observed by us weighed 16 pounds. It was taken in a pound net at Ocean View during the early part of April, 1922. This fish was said by dealers to be one of the largest ever caught in the bay, and in fact, it probably represents the maximum size attained by the species. Fish weighing 8 to 12 pounds are not uncommon in the spring, but during the fall individuals weighing over 8 pounds are rare.

Habitat.—New York to Texas.

Chesapeake localities.—(*a*) Previous records: Lower Potomac, Cape Charles city, Old Point Comfort, and Norfolk. (*b*) Specimens in collection: From numerous localities, from Annapolis, Md., to Cape Charles and Cape Henry, Va.

Comparison of lengths and weights of spotted squeteagues

Number of fish weighed and measured	Length	Weight	Number of fish weighed and measured	Length	Weight
	Inches	*Ounces*		*Inches*	*Lbs. Oz.*
1	5	0.6	1	12	9.5
2	7¼	2.0	1	15¼	1 5.6
1	7¾	2.3	1	17¼	2 1.0
1	8	2.6	1	18	2 10.0
1	8½	3.5	1	19	2 8.6
1	9	3.8	2	20½	3 5.7
2	10¼	6.0	2	22½	4 15.0
1	11¼	7.0	1	27	8 6.5
1	11½	9.0			

164. Cynoscion nothus (Holbrook). "Bastard trout"; Silver squeteague.

Otolithus nothus Holbrook, Ichth., South Carolina, 1860, p. 134, Pl. XIX, fig. 1; South Carolina. Lugger, 1878, p. 111.
Cynoscion nothus Jordan and Evermann, 1896–1900, p. 1406, Pl. CCXX, fig. 561.

Head 3.2; depth 3.3 to 3.5; D. X–I, 28 or 29; A. II, 9; scales 68 or 69. Body compressed, rather deep; back more strongly elevated than in related species; head long; snout moderate, 3.9 to 4.05 in head; eye 3.9 to 4.25; interorbital 4.55; mouth large, oblique; lower jaw projecting; maxillary reaching vertical from posterior margin of pupil, 2.25 in head; teeth as in *C. regalis;* gill rakers 9 on lower limb of first arch; scales rather large, thin, ctenoid, extending on head and fins as in *C. regalis*, about eight between origin of anal and lateral line; caudal fin round; anal fin very small; fins otherwise as in *C. regalis*.

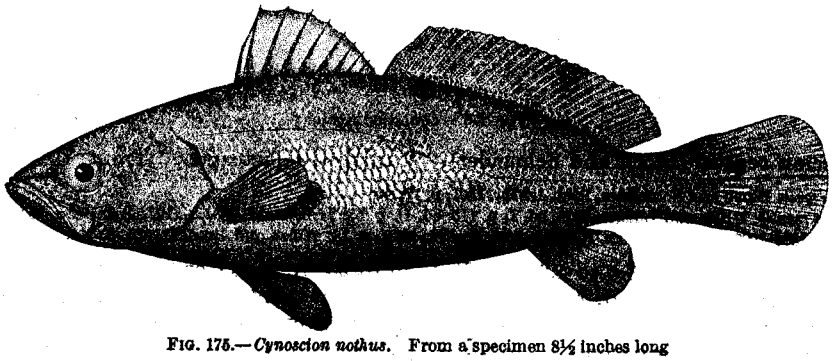

FIG. 175.—*Cynoscion nothus*. From a specimen 8½ inches long

Color plain greenish blue above; silvery below; no dark spots or reticulations; fins all plain; axil of pectoral dusky.

Two specimens, each 215 millimeters (8½ inches) in length, were preserved and form the basis for the foregoing description. This species, as already indicated, differs from *C. regalis*, its nearest relative, in the deeper and more compressed body. These differences are real and unmistakable when specimens of even size are compared. The scales are larger, the gill rakers are fewer, the anal fin is shorter, and the caudal fin is rounded in the specimens in hand, whereas in specimens of the same size of *C. regalis* the margin is nearly straight. The color is plainer than is usual for *C. regalis*, although this character is rather unreliable, as the writers have seen individuals of *C. regalis* that were equally as plain in color.

The figure published by Jordan and Evermann (1896–1900, Pl. CCXX, fig. 561) and republished by Smith (1907, p. 309, fig. 137) is misleading, as it appears to have been based on an unusually slender fish. Furthermore, the scales are represented as much smaller than they are in the specimens at hand and in the original color plate of Holbrook.

Welsh and Breder (1923, p. 169) found that *regalis* and *nothus* are closely related, and they state that further study may show them to completely intergrade. Coles (1916, pp. 30 and 31) concluded that *C. nothus* is an abnormal *regalis*, saying that his specimens always were caught with *regalis*, the body was not more compressed, and the only obvious difference between the two was in the color. One of us (Hildebrand), working at Beaufort, N. C. (i. e., in the same general vicinity where Doctor Coles obtained his specimens), also found specimens of Cynoscion that agreed in color with *nothus*, but no other tangible difference between them and specimens of *regalis* appeared to be present; he, too, arrived at the tentative conclusion that *nothus* was a plain-colored *regalis*. The specimens examined by Coles and Hildebrand in the vicinity of Beaufort, N. C., quite probably were abnormally colored *regalis*, for the differences between a true *nothus*, such as we believe to have in hand now, and a *regalis* are so evident and so numerous that they scarcely would have been overlooked.

The fishermen of the lower part of Chesapeake Bay recognize this species and call it the "bastard trout." It is taken only now and then, and it is not numerous enough to be of commercial importance. On the coast of the Gulf States it is said to be a food fish of some importance.

Habitat.—Maryland to Texas.

Chesapeake localities.—(*a*) Previous record: Baltimore, Md. (*b*) Specimens in collection: From Lynnhaven Roads, Va.; taken in pound nets, August 22, 1921.

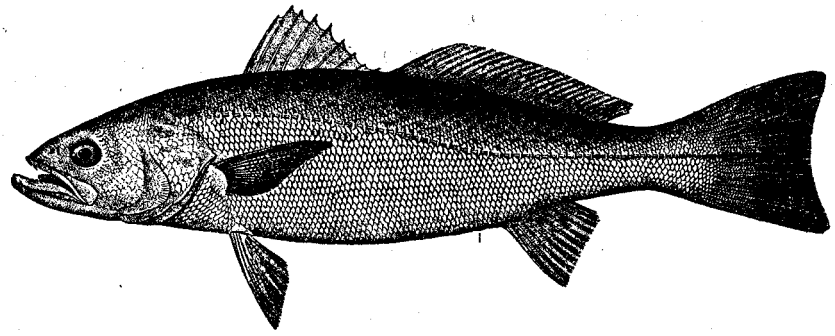

FIG. 176.—*Cynoscion regalis*

165. Cynoscion regalis (Bloch and Schneider). Weakfish; Squeteague; "Trout;" "Gray trout."

Johnius regalis Bloch and Schneider, Syst. Ichth., 1801, p. 75; New York.

Cynoscion regalis, Uhler and Lugger, 1876, ed. I, p. 116; ed. II, p. 98; McDonald, 1882, p. 12, fig. 3; Bean, 1891, p. 88; Jordan and Evermann, 1896-1900, p. 1407, Pl. CCXX, fig. 562; Fowler, 1918, p. 18; Welsh and Breder, 1923, p. 150.

Head 2.9 to 3.3; depth 3.5 to 4.25; D. X–I, 25 to 28; A. II, 11 or 12; scales 76 to 86. Body elongate, not much compressed; head long and low; snout pointed, 4.85 to 5.15 in head; eye 3.1 to 5.6; interorbital 4.1 to 4.75; mouth large, oblique; lower jaw projecting; maxillary reaching posterior margin of pupil or beyond, 2.1 to 2.4 in head; teeth in jaws pointed, in two series anteriorly, becoming single posteriorly, at least in lower jaw, two enlarged, recurved teeth usually present in anterior part of upper jaw; gill rakers long, 11 to 13 on lower limb of first arch; scales rather thin, finely ctenoid, extending on head, cheeks, and opercles; reduced scales also present on fins, about 10 rows between origin of anal and lateral line; dorsal fins contiguous in young, well separated in adult, the first composed of flexible spines, the third and fourth the longest, somewhat higher than the longest soft rays, soft part of dorsal long, with nearly straight margin; caudal fin with concave margin in adult, round in young; anal fin small, situated under posterior part of dorsal, its base ending a little in advance of that of dorsal; ventral fins rather small, inserted a little behind base of pectorals; pectoral fins short, failing to reach tips of ventrals, 1.65 to 1.95 in head.

Color largely greenish above and silvery underneath, upper parts with metallic reflections of purple and gold; upper parts of sides marked with black, dark green, and bronze blotches, mostly arranged in oblique wavy lines; dorsal and caudal dusky, with yellowish green tinge; anal and ventrals bright yellow; pectorals pale outside; axil dusky.